REMARKS

In the Final Office Action mailed January 13, 2005, Claims 7-11 and 13-15 stand rejected under 35 USC § 102(e) as allegedly being anticipated by Marash et al. (U.S. Patent No. 6,049,607). In addition, Claim 12 stands rejected under 35 USC § 102(b) as being allegedly anticipated by Betts et al. (U.S. Patent No. 5,828,657. Finally, Claims 1-6 and 16 stand rejected under 35 USC § 103(a) as being allegedly unpatentable over Marash et al. (U.S. Patent No. 6,049,607) in view of Betts et al. (U.S. Patent No. 5,828,657). Applicants have cancelled without prejudice claims 1-6, 12 and 16. Therefore, claims 7-11 and 13 -15 are the only currently pending claims.

After a careful review of the currently pending claims, Applicants respectfully request reconsideration of the pending rejections in view of the following remarks and claim clarifications.

I. CLAIM REJECTIONS UNDER 35 U.S.C. § 102(e)

Claims 7-11 and 13-15 stand rejected under 35 USC § 102(e) as being allegedly anticipated by Marash et al. (U.S. Patent No. 6,049,607). Applicants respectively traverse.

A. Applicants' Presently Claimed Invention

Applicants' presently claimed invention generally relates to echo cancellers that distinguish speech signals from other types of communication signals and echo cancellers that are enabled based upon the type of communication signal received from an outside source. (Applicants' Specification p. 2, lines 3 – 6).

As Applicants describe, in telecommunication networks, a subscriber device is connected to other subscriber devices using various connection techniques. For example, over short distances, two-wire lines may be employed. For longer distances, four-wire lines may be used.

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In addition, hybrid circuits are used to connect two-wire lines to four-wire lines.

Voice messages are transmitted through the network. For instance, if the subscriber device is a telephone, a voice message may be transmitted from a telephone, over a two-wire line to a first hybrid circuit, and then over a four-wire line to a second hybrid circuit. The second hybrid circuit may be connected to a second subscriber device.

In addition to voice messages, telecommunication networks also transmit data signals. Many of the data signals are narrow-band. For example, narrow-band data signals generated by V.21 modems are transmitted over telecommunication networks. Although some data signals can not be classified as narrow-band signals, these signals are modulated, and, therefore, their energy centers around a carrier frequency. (Applicants' Specification p. 2, lines 9 – 21).

The system and method determine whether far and near-end signals are predetermined types of signals, such as modulated signals used to transmit data. The invention then ascertains further information concerning the near and far-end signals and determines whether to freeze the adaptation of the echo canceller or bypass the echo canceller based upon this information. (Applicants' Specification p. 2, lines 3 – 6).

Applicants describe the operation of such a system in Figure 2. As illustrated in Figure 2, at step 202, the system determines the nature of the near and far-end signals. In other words, the system determines whether the signals (far-end and near-end) are of a certain type, such as, modulated data signals. At step 204, the system uses the results at step 202 to make a branching decision. For example, if data was detected at step 202, then control proceeds to step 206. If data was detected, that is, at least one of the signals represents a data signal, then at step 206, the system determines whether the adaptive filter converges. Step 206 may have already been determined earlier. For example, a training signal is supplied before data signal transmission and

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the adaptive filter converges to the true echo path by the training. If the answer at step 206 is affirmative, then control continues at step 210 where adaptation is frozen. If the answer is negative, control continues at step 212 where the echo canceller is disabled. (Applicants' Specification at p. 19 lines 11 – 21).

As Applicant illustrates in Figure 4, a module that controls adaptive filter is described. A carrier signal detect module 408 is coupled to a generate action module 410. The generate action module 410 is coupled to a convergence determination module 402.

A data signal indicator 416 is coupled to the generated action module 410. When the data signal indicator is asserted, the generate action module 410 is activated. The carrier signal detect signal receives the far-end input x(n), over a lead 418 and the near-end input y'(n), over the lead 420. The carrier signal detect module 408 determines if at least one input is a carrier (data) signal. The convergence determination module 402 determines whether the adaptive filter will diverge for data signals. Convergence is determined if Echo Return Loss Enhancement is greater than a threshold. Typically, the threshold is 16 db. A determination in then made if there are significant coefficients in the adaptive filter that focus on the beginning of the adaptive filter and follow the pattern described by equations (17) and (29). If the answer is affirmative, convergence exists. If the answer is negative, convergence does not exit. In any case, the convergence determination module 402 outputs a convergence detected lead 404 that indicates that convergence was detected and a no convergence detected lead 406, which indicates that no convergence was detected. The leads 404 and 406 are coupled to the generated action module 410.

The generate action module 410 receives the leads 404 and 406. It uses the information on these leads plus the information on the lead 416 to determine an action to take. The action

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may be either freezing the adaptation of the adaptive filter 44 or it may be bypassing the adaptive filter. If the adaptive filter is bypassed, then the adaptive filter is no longer connected to the far-end input and it does not generate an estimate of the echo in the echo channel. The generate action module 410 generates a bypass adaptive filter lead 422, which indicates that the adaptive filter is to be bypassed, and a freeze adaptation lead 426, which indicates that the adaptation of the adaptive filter is to be frozen. If neither of the leads 422 and 426 is asserted, then neither of the actions will be taken. (Applicant's Specification at p. 20 line 20 to p. 22 line 2).

Presently pending Independent Claims 7 and 13 have been clarified and are now expressly directed to such a control module. For example, Independent Claim 1 has been amended to expressly recite a control means comprising a carrier detect module coupled to a generate action module, wherein the generate action module is coupled to a convergence determination module. The carrier detect module determines if at least one input is a data signal, the convergence determination module determines whether the adaptive filter diverges for the data signal. The generate action module determines whether to freeze or bypass the adaptation filter. Independent Claim 13 recites similar limitations.

Applicant respectively submits that Marash '607 does not disclose a control means comprising a carrier detect module coupled to a generate action module, the generate action module coupled to a convergence determination module. Naturally, therefore, Marash '607 fails to disclose a carrier detect module that determines if at least one input is a data signal, and a convergence determination module that determines whether the adaptive filter diverges for the data signal. Marash '607 also fails to disclose a generate action module that determines whether to freeze or bypass an adaptation filter.

Rather, Marash '607 appears generally directed to echo-cancellation in full-duplex

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teleconferencing systems. Marash '607 describes a preferred situation where the echo-canceling system updates a transfer function continuously in real time. (Marash '607 Col. 2, lines 11-14).

To achieve this, Marash '607 relies upon an adaptation process by which the echo-canceling system is updated in real time may be an LMS (least means square) adaptive filter with the far-end signal used as the reference signal. Marash '607 further describes that the LMS filter estimates the interference elements (echoes) present in the interfered channel by multiplying the reference channel by a filter and subtracting the estimated elements from the interfered signal. The resulting output is used for updating the filter coefficients. The adaptation process will converge when the resulting output energy is at a minimum, leaving an echo free signal. (Marash '607 Col. 2, lines 14-25).

However, as Applicant's specifically point out in their Application, LMS has certain inherent problems that Applicants have solved. For example, Applicants note that one consequence of using hybrid circuits to couple different types of connections together is the creation of echoes. That is, speech may be reflected by a hybrid circuit back to the speaker, causing the speaker to hear their own voice. Echo cancellers are used to minimize or eliminate the effects of these echoes. (Applicant's Specification at p. 3. lines 1-4).

Echo cancellers may use adaptive filters. An adaptive filter, using a filtering algorithm, produces a mathematical model of echo characteristics, which is used to generate an echo estimate. For example, if a first subscriber device sends a signal to a second subscriber device, an echo may be created. A return signal is formed, which comprises a signal sent from the second device together with the echo. When echo cancellation is performed, the echo canceller subtracts the echo estimate (created by the adaptive filter) from the return signal. Thus, the signal received by the first device should be echo-free or substantially echo-free. (Applicant's

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Specification at p. 3. lines 5-11).

Applicants note that the filtering algorithms used in adaptive filters as referenced in Marash '607 have inherent limitations. For example, an adaptive filter, which uses the least mean square (LMS) algorithm in the adaptive filter, may diverge for narrow-band data signals. Specifically, although the echo may be cancelled, the adaptive filter will not converge the true echo path. In fact, the echo canceller will diverge to a filter related to the narrow-band frequency. (Applicant's Specification at p. 3. lines 12-16). Marash '607 only teaches the use of LMS algorithms, Marash '607 does not teach or suggest determining whether a far-end signal is a modulated signal.

To anticipate a claim, "each and every element set forth in the claim [must be] found, either expressly or inherently described, in a single . . . reference." *Vergall Bros. V. Union Oil Co. of California*, 814 F.2f 628, 631 (Fed. Cir. 1987) (M.P.E.P. Section 2131). Consequently, since Marash '607 does not teach or suggest a control means comprising a carrier detect module coupled to a generate action module, Marash '607 fails to teach a generate action module coupled to a convergence determination module. Marash '607 also does not teach or suggest a carrier detect module that determines if at least one input is a data signal or a convergence determination module that determines whether the adaptive filter diverges for the data signal,let alone a generate action module that determines whether to freeze or bypass the adaptation filter. Marash '607 therefore does not to teach every element of the claimed invention and, therefore does not anticipate Independent Claims 7 or 13.

II. SUMMARY

In view of the remarks above, Applicants' respectfully submit that the present application is in condition for allowance and solicits action to that end. If there are any additional matters

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that may be resolved or clarified through a telephone interview, the Examiner is respectfully requested to contact Applicant's undersigned representative.

Respectfully submitted,

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